WHAT IS CLAIMED IS:

1. A magnetic sensing element comprising:

a lower electrode layer;

a multilayer film comprising a first antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic material layer, and a first free magnetic layer deposited in that order on the lower electrode layer;

first insulating layers disposed on both end faces in the track width direction of the multilayer film;

a second free magnetic layer disposed over the first insulating layers and the first free magnetic layer;

second antiferromagnetic layers disposed on both side regions of the second free magnetic layer facing the first insulating layers in the thickness direction; and

an upper electrode layer disposed over the second antiferromagnetic layers and the second free magnetic layer exposed to a space between the second antiferromagnetic layers in the track width direction.

2. A magnetic sensing element according to Claim 1, further comprising second insulating layers covering the second antiferromagnetic layers, wherein the upper electrode layer is disposed over the second insulating layers and the second free magnetic layer exposed to the space between the second insulating layers in the track width direction.

3. A magnetic sensing element according to Claim 1,

further comprising a nonmagnetic layer interposed between the first free magnetic layer and the second free magnetic layer.

4. A magnetic sensing element according to Claim 3, wherein the nonmagnetic layer comprises at least one of Ru, Re, Pd, Os, Ir, Pt, Au, Rh, Cu, and Cr.

5. A magnetic sensing element according to Claim 1, further comprising a ferromagnetic layer interposed between the second free magnetic layer and each second antiferromagnetic layer.

6. A magnetic sensing element according to Claim 5, wherein the upper surface of the second free magnetic layer is exposed to a space between the second antiferromagnetic layers in the track width direction, and a nonmagnetic layer is disposed on the exposed upper surface.

7. A magnetic sensing element according to Claim 1, further comprising a third antiferromagnetic layer disposed on the second free magnetic layer, wherein the second antiferromagnetic layers are disposed on both side regions of the third antiferromagnetic layer.

8. A magnetic sensing element according to Claim 7, wherein the upper surface of the third antiferromagnetic layer is exposed to a space between the second antiferromagnetic layers in the track width direction, and a

nonmagnetic layer is disposed on the exposed upper surface.

9. A magnetic sensing element according to any one of Claims 1 to 8, wherein the lower electrode layer functions as a lower shielding layer and the upper electrode layer functions as an upper shielding layer.

10. A method for fabricating a magnetic sensing element comprising the steps of:

(a) forming a multilayer film on a lower electrode layer, the multilayer film comprising a first antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic material layer, and a first free magnetic layer deposited in that order from the bottom;

(b) trimming both end faces in the track width direction of the multilayer film and forming first insulating layers on the end faces;

(c) forming a second free magnetic layer over the first insulating layers and the first free magnetic layer;

(d) forming second antiferromagnetic layers on both side regions of the second free magnetic layer facing the first insulating layers in the thickness direction; and

(e) forming an upper electrode layer over the second antiferromagnetic layers and the second free magnetic layer exposed to a space between the antiferromagnetic layers in the track width direction.

11. A method for fabricating a magnetic sensing element

according to Claim 10, further comprising a step of covering the second antiferromagnetic layers with second insulating layers between the steps (d) and (e), wherein, in the step (e), the upper electrode layer is formed over the second insulating layers and the second free magnetic layer exposed to a space between the second antiferromagnetic layers in the track width direction.

12. A method for fabricating a magnetic sensing element according to Claim 10, wherein, in the step (a), a nonmagnetic layer is formed on the top of the multilayer film, and in the step (c), before the second free magnetic layer is formed, the nonmagnetic layer is at least partially removed.

13. A method for fabricating a magnetic sensing element according to Claim 12, wherein the nonmagnetic layer comprises at least one of Ru, Re, Pd, Os, Ir, Pt, Au, Rh, Cu, and Cr.

14. A method for fabricating a magnetic sensing element according to Claim 13, wherein the nonmagnetic layer is formed at a thickness of 3 to 20 Å.

15. A method for fabricating a magnetic sensing element according to Claim 10, wherein, in the step (c), a nonmagnetic layer is formed on the second free magnetic layer, the nonmagnetic layer located in regions corresponding to the first insulating layers in the thickness direction is removed,

and then ferromagnetic layers are formed on both side regions of the second free magnetic layer, and in the step (d), the second antiferromagnetic layers are formed on the ferromagnetic layers.

16. A method for fabricating a magnetic sensing element according to Claim 10, wherein, after the step (c), a third antiferromagnetic layer is formed on the second free magnetic layer, a nonmagnetic layer is formed on the third antiferromagnetic layer, and then the nonmagnetic layer located in regions corresponding to the first insulating layers in the thickness direction is removed, and in the step (d), the second antiferromagnetic layers are formed on the side regions of the third antiferromagnetic layer.

17. A method for fabricating a magnetic sensing element according to Claim 16, wherein the third antiferromagnetic layer has a thickness of 20 to 50 Å.

18. A method for fabricating a magnetic sensing element comprising the steps of:

(a) forming a multilayer film on a lower electrode layer, the multilayer film comprising a first antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic material layer, and a first free magnetic layer deposited in that order from the bottom;

(b) trimming both end faces in the track width direction of the multilayer film and forming first insulating layers on

the end faces;

(c) forming a second free magnetic layer over the first insulating layers and the first free magnetic layer;

(f) forming a second antiferromagnetic layer and a second insulating layer on the second free magnetic layer;

(g) forming a mask layer on the side regions of the second insulating layer corresponding to the first insulating layers in the thickness direction, and removing the central regions of the second insulating layer and the second antiferromagnetic layer not covered with the mask layer to expose the upper surface of the second free magnetic layer to a space between the side regions of the second insulating layer; and

(e) forming an upper electrode layer over the second antiferromagnetic layers and the second free magnetic layer exposed to a space between the antiferromagnetic layers in the track width direction.

19. A method for fabricating a magnetic sensing element according to Claim 18, wherein, in the step (g), the central region of the second antiferromagnetic layer is trimmed off halfway, and in the step (e), the upper electrode layer is formed over the side regions of the second insulating layer and the second antiferromagnetic layer exposed to a space between the side regions of the second insulating layer.

20. A method for fabricating a magnetic sensing element

according to Claim 19, wherein the thickness of the second antiferromagnetic layer remaining in the central region is 50 Å or less.